Studies on the bionomics of sphecoid wasps. I. *Moniaecera asperata*

(Hymenoptera : Sphecidae)

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According to Muesebeck, Krombein, and Townes (1951) the genus *Moniaecera* is represented in the fauna of North America only by the typical subgenus. This subgenus is further represented by only five species as follows: *M. abdominalis* (Fox) from Georgia, Texas, and Arizona; *M. asperata* (Fox) from Texas, New Mexico, Arizona, and California; *M. evansi* Pate from Arizona; *M. foxiana* Pate from California; and *M. pinal* from Arizona and California. Of these five species, notes on the behavior, nesting habits, and prey are known only for *M. abdominalis* (Fox) through observations made by Hartman (1905) at a location near Austin, Texas.

In this location Hartman found *M. abdominalis* to be abundant in August and September where they were seen flying around low vegetation in a wooded area. He also observed that while hunting on the vegetation this wasp makes frequent contact with the leaves, sticks, and blades of grass with its antennae while evidently searching for its prey. The prey was found to consist exclusively of the leafhopper *Tylozygus bifidus* (Say). The entrance to the nest was a tiny hole in the middle of a small, flat elevation in the sand. The burrow extended nearly horizontally for 2.5 inches then nearly vertically for 0.4 inch, ending in a small pocket or cell at the bottom in which there were a number of leafhoppers but no wasp egg. The burrow had a uniform diameter of 2 mm.

The following observations on *Moniaecera asperata* were made on a study plot located two miles northeast of Portal, Cochise County, Arizona, elevation 4700 feet, between 28 May and 6 June 1962. During this period numerous specimens were observed flying slowly and erratically just above the surface of the ground, 2–10 inches, in open areas between the following plant species: *Prosopis juliflora* (Swartz) DC. (mesquite), *Flourensia cernua* DC. (tar-bush or varnish-bush), *Larrea tridentata* (DC.) Caville (creosote-bush), *Parthenium incanum* H. B. K. (mariola), *Salsola kali* L. (Russian-thistle), *Verbesina encelioides* (Cav.) Benth and Hook (crown beard), *Baileya multiradiata* Harv.

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EXPLANATION OF FIGURE

Fig. 1. Burrow entrance of *Moniaecera asperata* (Fox).

and Gray, *Gutierrezia microcephala* (DC.) Gray (snake-weed), and *Solanum elaeagnifolium* Cav. (white or silver horse-nettle). No wasps were observed landing on either the plants or the sandy ground in the open areas between them.

The breeding site was located adjacent to the area described above in a shallow borrow-pit from which the plants and topsoil had been scraped exposing the rocky, hard-packed, caliche layer beneath (Fig. 1). The burrow entrance was located about one-half inch from the edge of a small rock; the opening was irregular in shape (Fig. 1) and measured 4 mm across its widest diameter. There was no sign of excavated dirt around the entrance which was flush with the gently sloping surface.

Immediately inside the entrance the burrow became rounded in shape and varied only slightly from being 4 mm in diameter for its entire length. The first two inches of soil were hard packed and dry but below this level it was loose and slightly moist. The burrow went straight down for 50 mm, angled slightly toward the south, and continued

downward at a steep angle for another 55 mm to the first cell. This cell projected off the main burrow on the west side and the main burrow continued on downward for another 10 mm. No evidence of either the main burrow or additional cells was found below this 115 mm depth.

The female was first observed entering this burrow on 1 June 1962 and was seen going in and out several times on this date. Similar observations were made on 5 June 1962 during which time she was seen to fly almost directly into the burrow carrying green-colored prey. There was little or no hesitation at the burrow entrance. On 5 June 1962 at 1:30 p.m. she was collected as she came in carrying an adult psyllid and the burrow was excavated on 6 June 1962.

The cell that had evidently been completed and sealed off from the main burrow was found to contain three specimens of *Circulifer tenellus* (Baker), the beet leafhopper; 10 specimens of *Empoasca abrupta* DeLong, the western potato leafhopper; a fragment of one psyllid identified by Miss Russell as a species of *Paratrioza*; two specimens of a new species of psyllid belonging to the genus *Aphalaroida* that breeds on *Prosopis* (Jensen reference number J. 332); a large wasp larva that was injured in digging; and the remains of a number of leafhoppers. Judging from the size of the adult *M. asperata* (Fox) this larva was nearly mature and ready for pupation even though there were still 13 leafhoppers and two psyllids available in the cell. There was no evidence of a second egg on any of these specimens. One *Empoasca abrupta* DeLong was found at the bottom of the main burrow and the female was caught carrying a specimen of *Aphalaroida* n. sp. She was probably getting ready to stock another cell and evidently piles the prey up at the end of the burrow before excavating the cell.

In summary: (1) *Moniaecera asperata* (Fox) uses species in both the families Cicidellidae and Psyllidae as prey. (2) The first or shallowest cell is the oldest. (3) There are evidently a number of cells in each burrow. (4) The paralyzed prey are accumulated at the end of the burrow before being placed in a cell. (5) *M. asperata* unlike *M. abdominalis* digs its burrow nearly vertical, at least in the upper portions.

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A Note on the Prey and Nest Structure of *Stigmus inordinatus inordinatus*

(Hymenoptera : Sphecidae)

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Early in 1962, a shipment of two small, black, sphecoid wasps was submitted to the California Department of Agriculture Insect Identification Laboratory. They were collected at Santa Paula, Ventura County, California, 2 February 1962, by B. Osuna. Associated with the wasps were pieces of peony twig (*Paeonia suffruticosa*) and apterous forms of a small aphid.

Subsequently, additional material was sent to us which included a longer series of the sphecoid, the twigs from which they were reared, and many more aphids which were found packed in cells in some of the twigs. The twigs of mulberry (*Morus alba*) were present in the shipment and a note from the collector stated that the wasps were nesting in mulberry to an even greater extent than in peony.

Our preliminary determination of the wasp showed it to be a member of the genus *Stigmus*. It was then sent to Dr. K. V. Krombein, who determined it as *Stigmus inordinatus inordinatus* Fox, an austral form occurring in Colorado, New Mexico, Arizona, and California. The aphid proved to be the *Aphis* sp. possibly *frangulae* Kaltenbach (apterous forms only) according to the determination by L. M. Russell.

The one published note on the biology of *Stigmus i. inordinatus* (Rohwer, S. A., 1909, Trans. Amer. Entomol. Soc., 35: 102) states only that Mrs. Cockerell saw a member of this form catch aphids. Thus the fragmentary information presented here will fill out to some degree the almost complete lack of biological data on this species.